perturbations were more intense on the meridian passage of a region which, having been active before, was increasing in activity.

Three excellent drawings of the great January to April (1905) sun-spot made by Prof. Mascari are reproduced in No. 7, vol. xxxvi., of the *Memorie della Società degli Spettroscopisti Italiani*.

THE JUVISY OBSERVATORY.—An interesting description, illustrated with photographs, of the Juvisy Observatory appears in the August and September issues of the *Bulletin de la Société astronomique de France*. The observatory was founded in 1883 by M. Flammarion, and is principally engaged on planetary observations.

BOTANY AT THE BRITISH ASSOCIATION.

THE time of Section K was considerably occupied in joint meetings with other sections. Thus there was a joint discussion with Section D on "The Physical Basis of Heredity," of which an account will be found in "Zoology at the British Association" (NATURE, September 19, p. 530), and another with Sections D and L on "The Teaching of Biology in Schools," which is described in "Education at the British Association" (NATURE, September 12, p. 505).

A third joint meeting was held, with Sections C, D, and E, to hear an address by Prof. Conwentz, the Prussian State Commissioner for "Naturdenkmalpflege," on "The Preservation of Natural Monuments." Prof. Conwentz explained that the phrase "natural monuments" was new in Germany as well as in England, but we should recognise that there could be monuments of nature as well as of art. The constant inroads of cultivation and of industrial undertakings have led, and are leading, especially in countries with crowded populations, to the disappearance of scientifically interesting and even unique natural objects and types of scenery. A widespread feeling has arisen that as much as possible should be done to prevent such destruction, and this has recently led, not only to much local effort directed towards this end, but in Prussia to the institution of a special State department under the Minister of Education for the purpose of directing and coordinating such efforts. This department (of which the lecturer is the head) has no funds allotted to it for the actual purchase of land bearing natural monuments, nor is it considered that purchase is the right procedure except in special cases. The aim is rather to get private owners interested in the natural monuments on their property, and to induce them to be responsible for their safeguarding and preservation. In the case of Government land, the Forestry Department cooperates by making regulations prohibiting the felling of unique trees, the total clearance of particular types of woodland, &c. Prof. Conwentz's department is prepared to initiate all effort of this kind in Prussia. Its activity has already, during the single year of its existence, met with considerable success. Many areas of primitive marsh and water, heath and woodland, often containing rare and interesting characteristic species of animals and plants, have been saved from destruction, and arrangements made for their permanent preservation. The necessary work falls under three heads:—first, the cataloguing of the natural monuments of the country; secondly, the mapping and scientific description of such monuments; and thirdly, the undertaking of appropriate means for their preservation.

Prof. Conwentz directed attention to the numerous organisations in this country the work of which tends towards this general object, but pointed out that none of them have precisely the same ends in view as his Prussian department. He particularly mentioned the Commons Preservation Society, the Kyrle Society, the National Trust for the Preservation of Places of Historic Interest and Natural Beauty, and the Central Committee for the Survey and Study of British Vegetation. He suggested that the last-named organisation might add the preservation of British vegetation to its objects, and also that efforts in this direction might be helped by the British Association. He pointed out that love for and care of the characteristic natural scenery of the homeland was one aspect of true patriotism, and should act as a check on the purely materialistic development of modern civilisation. The lecture was illustrated by a beautiful series of lantern-slides showing types of protected scenery in Germany, and also of many British examples of a similar kind.

Discussion on the Cytology of Reproduction in the Higher Fungi.

This occupied most of Monday morning, August 5. Three papers were read, and were followed by a discussion.

In the first paper Miss Fraser and Miss Chambers described the development of the ascocarp in *Aspergillus* (*Eurotium*) *herbariorum*. The archicarp consists of a unicellular trichogyne, a unicellular ascogonium, and a septate stalk. An antheridium, divided into a stalk and antheridial cell, is present, and usually fuses with the trichogyne; both structures are cœnocytic. After normal fertilisation or its equivalent, the ascogonium becomes septate and produces ascogenous hyphæ. A sheath is developed, and finally asci are formed. In these, nuclear fusion takes place, and three divisions follow, giving rise to the nuclei of the eight spores.

The authors regarded the genus Aspergillus as primitive, and related its archicarp to that of other groups of Ascomycetes. They pointed out that the male organ closely resembles the antheridium of discomycetous forms; on the other hand, if the antheridial cell, instead of fusing with a neighbouring archicarp, were set free from its parent hypha, it would scarcely differ from the spermatium of the Pyrenomycetes. They held, with Wolfe, that a similar development had taken place among the Florideæ, and regarded the Ascomycetes as a monophyletic group.

Miss Welsford's paper dealt with fertilisation in *Ascobolus furfuraceus*. She confirmed Harper's statement that the archicarp, or scolecite, originates as a row of uninucleate cells. These subsequently become multinucleate, and one increases in size and gives rise to ascogenous hyphæ. Nuclei migrate into this cell and undergo fusion before passing into its branches. Miss Welsford regarded this process as a form of reduced fertilisation, and suggested two interpretations—either (1) the scolecite is a multicellular female organ and the fusions are those of female nuclei in pairs, or (2) the ascogenous cell only is female, the other cells of the scolecite being vegetative and representing a functionless trichogyne and stalk; in this case fertilisation probably consists of the union of a female and a vegetative nucleus.

In the third paper Miss Fraser gave an account of the cytology of *Humaria rutilans*. In this species sexual organs are not developed, but a reduced form of fertilisation obtains, the nuclei of the vegetative mycelium fusing in pairs. Asci are developed from hyphæ which contain fusion nuclei; these show sixteen chromosomes, the sporophytic number, in their mitoses. In each ascus three nuclear divisions take place; the first is heterotype, the chromosomes dividing *transversely*, and the second homotype. These bring about a reduction, related here, as in all other investigated organisms, to normal or reduced fertilisation. During the prophases of the heterotype division, a second nuclear fusion occurs; Miss Fraser suggested a mechanical explanation for this process, and showed that it was occasionally omitted. The sixteen chromosomes which are present throughout the meiotic phase represented the reduced number for two nuclei. The fusion in the ascus is compensated by a peculiar process of reduction taking place in the third division, and termed by Miss Fraser *brachymeiosis*. Sixteen chromosomes are formed from the spireme, and eight pass *without fission* to each daughter nucleus. The reduced number for one nucleus thus appears.

The author considered that this process probably occurred in connection with other asexual fusions also. She related her observations on *Humaria rutilans* to the facts described for Phyllactinia (Harper, 1905) and other Ascomycetes. In conclusion, she pointed out the close analogy between the two fusions in the life-history of Humaria, and suggested that the type of compensating reduction (whether meiotic or brachymeiotic) might be usefully employed to differentiate between sexual and asexual fusions.

The discussion was opened by Prof. Farmer, who agreed

that the spermatium of the Florideæ, and no doubt of the Ascomycetes, was closely related to a freed antheridium. He suggested the existence of a further analogy in connection with the events which follow fertilisation. In Ascomycetes a second nuclear fusion takes place in the ascus; in the Florideæ cell fusions occur, but the nuclei are indifferent or repelled. The cases described by Miss Fraser in which ascus nuclei continued their development without fusion might be regarded as intermediate. Prof. Farmer emphasised the dual aspect of nuclear fusion; the process was not primarily originated to associate paternal and maternal characters, but possessed a deep physiological significance.

Prof. Blackman also accepted the theory put forward as to the phylogeny of the male organ. He regarded the variety of female organs among Ascomycetes as difficult to reconcile with their monophyletic origin. The occurrence of both cœnocytic and uninucleate structures was a specially difficult point. With regard to the sexuality of the Ascomycetes, a fairly complete series now existed, including Pyronema (Harper, 1900) and other forms with normal fertilisation; Lachnea (Fraser, 1907) and *Humaria granulata* (Blackman and Fraser, 1906), where the nuclei of the ascogonium fuse in pairs; Ascobolus, where fusion is probably between a female and a vegetative nucleus; and *Humaria rutilans*, where sexual organs are lacking and the vegetative nuclei fuse. Prof. Farmer, in a recent paper, had grouped such various forms of reduction under the general term pseudapogamy, but Prof. Blackman felt that a more detailed classification was required. A further stage would be that in which no fusion took place, and one would then expect a corresponding difference in the divisions in the ascus.

Prof. Blackman accentuated the importance of *Humaria rutilans* as the first case in which the behaviour of the chromosomes in asexual fusions had been elucidated, and dealt with the difference between synaptic and non-synaptic reduction, associating the latter with the fusion of undifferentiated nuclei. In Humaria there is no physiological difference between the two fusions, but the first is obviously the relic of a normal fertilisation. He regarded the definition of a sexual fusion as dependent on the origin of the process, and not on the subsequent behaviour of the nucleus.

Prof. Hartog considered the attempt to differentiate between fusions of sexual and of vegetative nuclei in the ascogonium as puerile, since the pronuclei lose their distinctive sexual characteristics before fusion. He pointed out that brachymeiosis differs from other known types of division in that a sorting, but no splitting, of the chromosomes takes place, and referred to the unexplained fusions of three gametes in the Volvocineæ.

Dr. Darbishire spoke of the complex structure of the multicellular ascogonia of Lichens, and Prof. Buller suggested that a study of the phenomena of spore distribution might throw light on the phylogeny of the Ascomycetes.

Miss Fraser, in replying, dealt with various points raised during the discussion, and pointed out that the difficulty of relating cœnocytic with uninucleate forms was lessened by the occurrence of both states in the scolecite of Ascobolus.

Physiological Papers.

Prof. H. E. Armstrong read a paper by Dr. E. F. Armstrong and himself on "Enzymes, their Mode of Action and Function," which, it is understood, will shortly be published in the *Annals of Botany*. The authors pointed out that the distinctive feature of the chemical changes going on in the bodies of organisms was the fact that they are under the *control* of the action of the bodies called enzymes. Great progress had been made in our knowledge and activity of these bodies within recent years, one of the outstanding conclusions being that all chemical equations involving their action are to be written as reversible changes. It has for a long time been usual to think of ferment action as mainly concerned with destructive metabolic action, but it is probable that the constructive activity of enzymes is really far more important biologically. The authors illustrated the probable structural relations of enzymes to the organic substances upon which they act by reference to the structural formulæ of various sugars, showing that when a given enzyme can act upon several different substances it is because it can work upon a group of atoms common to all these, and in each case holding together the other groups. In the case of albuminoids a complex enzyme is required, but the conception of a skeleton which can only be packed with atoms in a particular way enables us to see that it is unnecessary to assume a mechanism so complex as the structure that has to be produced. It is probable that we should conceive of the constructive activity of enzymes in this way—that the enzyme is a skeleton on which the complicated organic body can be built up. Dr. E. F. Armstrong replied to some questions put by Prof. Reynolds Green and others.

Prof. Bottomley communicated some results of his experiments on the inoculation of nitrogen-fixing bacteria in plants other than the Leguminosæ, and stated that tomatoes had been made to produce a greatly increased crop by this means, the bacteria having been first cultivated in tomato-juice; in wheat the bacteria had been induced to establish themselves in the cortex of the root, though no nodules like those on the roots of Leguminosæ are formed. The economic possibilities of these results, if capable of further development, are sufficiently obvious. Prof. Farmer remarked that this was a case in which we ought to have concluded that if the organism could be cultivated outside the plant it could be got to live upon other plant-cells containing carbohydrates. It had been shown that rusts could be induced to live on different hosts by special training. It was known that wheat can go on for an unlimited number of years producing about thirteen bushels to the acre, but this would probably be much exceeded without manuring if the wheat plants, by the aid of these bacteria, were enabled to fix atmospheric nitrogen.

Mr. F. Darwin read a paper on the cotyledon of Sorghum as a sense organ. It was directed towards confirming the belief that the cotyledon is the seat of geotropic sensitiveness, evidence for which was given in a paper read before Section K at Dover (1899), and published in the *Annals of Botany*. The results given in the present paper were obtained partly by Czapek's "glass-boot" method and partly by an adaptation of Piccard's centrifugal method. The conclusions, though not perhaps finally convincing, are strongly in favour of the view that the cotyledon is the geosensitive region. The paper also contains observations on the traumatic and heliotropic curvatures of Sorghum.

Morphological Papers on Pteridophytes and Pteridosperms.

Prof. Bower read a paper on the embryology of Pteridophytes, embodying the result of his recent work on this subject. He pointed out that there are two types of pteridophytic embryo:—(1) the Lycopod type, which agreed with the Bryophytes in having a suspensor; and (2) the fern type, in which there is no suspensor. The main point he wished to bring out was that there is a definite polarity in the embryo defined at once by the first segmentation, the centre of the "epibasal segment" forming one pole coinciding with the stem apex. On the other hand, the polarity of the embryo with regard to the axis of the archegonium is quite variable, as is the number and time of origin of the first leaves and roots, and also of the haustoria and protocorms. In Isoetes there is no suspensor; the initiation of the polarity is changed, and is even variable within the species. The embryo of Isoetes is inverted as compared with an ordinary Lycopod embryo, but is otherwise in line with the other Lycopods. The initial polarity of *Botrychium obliquum*, according to Lyon's account, is also exactly inverted as compared with Ophioglossum. Goebel's position, that the organs of a plant are laid down in the most suitable positions according to circumstances, is not confirmed by the study of embryos. After the first segmentation the polarity is definitely fixed. There was an interesting discussion, in which Dr. Scott, Prof. Oliver, Prof. Weiss, and Mr. Worsdell joined, and which displayed a general agreement with the author's conclusions.

Mr. Gwynne-Vaughan contributed a striking paper on the real nature of the so-called tracheids of ferns. The author was led by some observations on fossil Osmundaceæ to investigate the pitting of the xylem

elements of modern ferns, and was led to the unexpected result that the "pits" are really quite open, placing the cavities of adjacent elements in free communication, while the pits themselves communicate with one another in the thickness of the wall, a "pit-closing membrane" being quite absent. In other words, the wall of the typical xylem element of a fern consists of corner columns joined by pairs of separate horizontal bars. In development the corner columns and bars are gradually lignified, while the pectic substance forming the rest of the primitive wall becomes granular and disappears. In *Pteris aquilina* the substance joining the two bars of each pair remains, though the pits themselves are open. The author exhibited preparations fully demonstrating the facts described in his paper.

Prof. F. W. Oliver read a paper on the structure and affinities of *Physostoma elegans* (Williamson), a pteridospermous seed from the Coal-measures, in which he gave a full description of the seed in question. Williamson afterwards called it *Lagenostoma physoides*, and it is certainly closely allied to the Lagenostomas. Nevertheless, it possesses certain curious and unique features which well warrant its separation, and lead to the conclusion that it represents one of the most primitive types of pteridospermous seed as yet discovered.

Mr. D. M. S. Watson described the cone of *Bothrodendron* (*Lepidodendron*) *mundum* as practically a Lepidostrobus with the radial extension of the sporophylls very much reduced, a state of things that would be expected from a consideration of the vegetative organs. It appeared that there had been a confusion with Miadesmia, the block containing the latter plant also having fragments of two other Lycopod cones, of which this is one. The idea of an immediate connection with Spencerites must be given up. In the course of the discussion Prof. Weiss remarked that we now know Bothrodendron more completely than any other fossil Lycopod.

Papers on Schizophyta.

Mr. David Ellis read a paper on the phylogenetic connections of the recent addition to the thread-bacteria, *Spirophyllum ferrugineum*, Ellis, in which he showed that the new species links the iron-bacteria with the genus Spiromonas, and suggested that the definition of Migula's order Chlamydobacteriaceæ should be modified so as to include both of these genera.

Mr. B. H. Bentley read a paper on cell-division in Merismopedia, in which he described a process like karyokinesis in the cells of this genus. The paper was somewhat adversely criticised by Mr. Wager.

Ecological Papers.

Prof. Yapp communicated a paper by Prof. H. H. W. Pearson (Cape Town) describing a botanical excursion to the Welwitschia desert. The conditions obtaining in this desert (German South-West Africa) are remarkably severe—the annual rainfall varies from zero to 3 cm., the illumination is very intense, and surface deposits of saltpetre and other salts are frequent. This severity of conditions, which must affect the germination of seedlings, results in an extreme paucity of vegetation. One may sometimes walk for miles without seeing a single flowering plant, while as regards species, in the British territory of Walfisch Bay, the total phanerogamic flora, excluding that of the Khusib river-bed, probably does not number more than twelve species. Welwitschia itself has a range extending from 14° to 23° S. latitude. It seems to prefer more or less sheltered and sloping valleys at an elevation of about 100 feet above sea-level. The author gave some interesting observations respecting the pollination of Welwitschia, adducing evidence to show that it is largely effected through the agency of a parasitic hemipterous insect (Odontopus), which is apparently never absent from the plant.

By comparing the Welwitschia plants of known age at Kew with the youngest seen in Damaraland, Prof. Pearson estimates that the latter cannot be less than forty to fifty years old. From this it follows that the conditions necessary for the successful germination of the seeds of Welwitschia occur but rarely. As there are not wanting indications that the rainfall of this area was once considerably in excess of the present one, it is to be feared that the effective reproduction of Welwitschia is now more rare than formerly, and that, with the continuance of the climatic conditions at present prevailing in western Damaraland, the species is doomed to become extinct in its native region.

Prof. R. H. Yapp gave a paper on the hairiness of certain marsh plants. A considerable number of plants found in damp or marshy habitats possess a more or less dense covering of hairs. Many of these plants, however, show seasonal differences in respect of hairiness. Thus the leaves formed in spring on low-growing shoots are usually small and glabrous, while the later leaves, especially those on the erect flowering shoots, are larger, and increasingly hairy. *Spiraea Ulmaria* was referred to in some detail. In spring this species successively forms glabrous, partly hairy and densely hairy leaves. The partly hairy leaves show a regular distribution of the tomentum on their lower surfaces, the leaves decreasing in hairiness from above downwards, while the margins are generally more hairy than the central parts of the lamina. This distribution of hairs is suggestive, in view of the fact that if *Spiraea ulmaria*, var. *denudata*, an entirely hairless variety, be grown in an exposed situation, its leaves suffer more than those of the hairy form, and that the withering due to exposure first begins in those parts of the leaf which, in the hairy variety, are the first to be covered with the tomentum.

Other Papers.

Mr. R. P. Gregory read a paper on the inheritance of certain characters in *Primula sinensis*, in which he dealt with experiments on the inheritance of long and short styles, leaf form, colour of stems and petioles, and, lastly, of flower colour. While some of these characters obey simple Mendelian rules, the colour inheritance presents very complex problems which are by no means completely elucidated. Two distinct classes of whites in flower colour were separated. Sutton's "Snowdrift," with pure green stems, is a true albino, but in all the other races of white-flowered plants a character occurs which inhibits the development in the flower of a colour potentially present in the plant. The results of crossing these "dominant whites" with coloured flowers are complex. Various partial explanations of the observed results were suggested by the author.

Local Papers.—A paper on Charnwood Forest, illustrated by particularly beautiful lantern-slides, was read by Mr. W. Bell, the local secretary, in which the scenery and vegetation of the forest were treated descriptively and historically, and by a comparison of old lists of species with those found at the present day the effect of drainage and cultivation on the native flora was brought out.

Mr. A. R. Horwood read a paper on the disappearance of certain cryptogamic plants from Charnwood Forest within historic times. In this paper the great impoverishment of the lichen flora was particularly noticed, and was attributed largely to the effect of smoke, a similar phenomenon to that observed in the region affected by the Lancashire and Yorkshire smoke-cloud.

Semi-popular Lecture.—Prof. Weiss delivered the semi-popular lecture on "Some Advances in our Knowledge of the Pollination of Flowers." The lecturer dealt with the newer work on this subject, and discussed its bearing upon the older views of the mechanisms of pollination.

Excursions.

By invitation of Mr. C. C. Hurst, an excursion (in conjunction with Section D) took place to Burbage to examine the results of his experiments on Mendelian heredity in rabbits, sweet-peas, &c., and also to witness a demonstration of the inheritance of eye-colour in man, for which about 100 school children from the families studied by Mr. Hurst were assembled. Most unfortunately, rain to some extent interfered with the success of these extremely interesting demonstrations, but Mr. Hurst very kindly repeated them in Section D at a later period of the meeting. The allelomorphic pair of characters in eye-colour studied by Mr. Hurst are the presence or absence of brown pigment on the front of the iris. Eves with the former

character are called *duplex*, with the latter *simplex*. "Duplex" is dominant to "simplex."

A successful excursion to Charnwood Forest, under the guidance of Mr. Bell, took place on the Saturday (August 3), and an excellent idea of the vegetation of the uncultivated portions of the forest was gained by the members of the section.

ECONOMIC GEOLOGY IN THE UNITED STATES.

STRIKING evidence of the work which the United States Geological Survey is carrying on for the direct advancement of mining interests throughout the country is afforded by a batch of eight Bulletins recently received. These Bulletins cover 1172 pages, and are copiously illustrated with plates and coloured geological maps. The most valuable of the series is Bulletin No. 315, dealing with contributions to economic geology in 1906, the object of which is to secure prompt publication of the economic results of investigations made by the survey. This Bulletin deals with the metals, structural materials, and other non-metals. A separate bulletin will be issued later dealing with survey work on coal, lignite, and peat. In investigations of ores during the year, reports are given by Mr. W. Lindgren on an interesting group of thin veins carrying wolfram in Boulder County, Colorado, which now constitute one of the most important sources of tungsten in the country; by Mr. H. S. Gale, on some new deposits of the uranium and vanadium-bearing mineral carnotite, which occur in the upturned Dakota sandstones east of the coal basins in Rio Blanco County, Colorado, deposits of importance as a further possible source of radium; and by Mr. G. F. Kay, on the deposits of silicate of nickel near Riddles, in Oregon. Much work was done in connection with iron ores, and reports are given on the red ores of the Birmingham district, Alabama, by Mr. E. F. Burchard; on the brown iron ores of the Russellville district, Alabama, by the same author; and on the grey iron ores of Talladega County, Alabama, by Mr. P. S. Smith. Mr. A. C. Spencer describes the magnetite deposits of Pennsylvania, and Mr. S. H. Ball the important iron-ore district at Hartville, Wyoming, and the titaniferous iron ore of Iron Mountain, Wyoming. An interesting investigation was made on glass-sands by Mr. Burchard. He gives the results of chemical and physical tests, not only of glass-sands now in use, but also of sands from undeveloped deposits which seem available for use as glass-making material. Prof. A. H. Purdue deals with the recently discovered phosphate fields of Arkansas, and Messrs. F. B. Weeks and W. F. Ferrier describe a new and important phosphate district at Montpelier, Idaho, in the western United States. The discovery has opened up a new industry in the West.

The progress of investigations of the mineral resources of Alaska in 1906 is dealt with in a separate report (Bulletin No. 314). An increase of nearly 50 per cent. in the value of the gold output of 1906 over that of the previous year is the best evidence of the advancement of the mining industry in Alaska. Copper mining has undergone a rapid expansion, and other mineral deposits, such as coal, marble, tin, and gypsum, have also received considerable attention. The progress has consisted in the development of the older districts rather than in discoveries of new mineral fields.

The Juneau gold belt, Alaska, forms the subject of a separate report by Mr. A. C. Spencer (Bulletin No. 287). This belt comprises the mainland strip of south-eastern Alaska from Berners Bay on the north-west to Windham Bay on the south-east, together with Douglas Island. The ores met with are mainly gold, though silver is usually present in small amounts. At the mines of the Treadwell group in Douglas Island, the methods of mining employed represent the highest possible attainment in the successful working of low-grade ores. For the last few years the average value of the material passing through the mills has been only about 8*s*. per ton.

The zinc and lead deposits of the Upper Mississippi Valley are described in great detail in a report by Mr. H. Foster Bain (Bulletin No. 294). The presence of ore deposits in this region was well recognised as early as 1687, but the early work was restricted to lead mining, the zinc ores being disregarded. The rise in the price of zinc ore in 1899 attracted attention to the district, and since 1903 its development has been rapid. The author gives an account of the present condition of the district and a statement of ideas relating to the formation of ores. The geology of the district is simple. The region is one of unmetamorphosed, little disturbed, sedimentary rocks of Palæozoic age, and there are no igneous rocks nor recent ones near it. The ore-bearing rock is a massive dolomite. The ores, consisting of blende, smithsonite with galena and marcasite, occur in crevices, in honeycomb masses, in pitches and flats, and as disseminations. The ore bodies are doubtless due to concentration or reconcentration through the action of underground waters.

A geological reconnaissance in south-western Nevada and eastern California is described by Mr. Sydney H. Ball (Bulletin No. 308). Ore deposits in the area described appear to be confined to the Palæozoic rocks, the post-Jurassic granitoid rocks, and the older Tertiary rocks.

The economic geology of the Independence quadrangle, Kansas, is described by Mr. F. C. Schrader and Mr. Erasmus Haworth (Bulletin No. 296), who present the substance of what is known concerning the distribution, occurrence, and development of petroleum and natural gas in the quadrangle, and note briefly the more important industries growing out of these natural resources. Mr. F. C. Clapp describes the economic geology of the Amity quadrangle, Eastern Washington County, Pennsylvania (Bulletin No. 300). The main interest in this area, which is situated near the centre of the north end of the Pittsburg coalfield, lies in the facts that it has been the seat of extensive petroleum and natural gas development, and that it is almost entirely underlain by at least one valuable seam of bituminous coal.

In the last report to be noticed Mr. E. C. Sullivan discusses the interaction between minerals and water solutions, with special reference to geological phenomena (Bulletin No. 312). Although not directly the result of geological field work, it has an important bearing on such work in that it is a chemical investigation of some of the problems most frequently met with in the study of the origin of ore deposits. Some of the changes that take place at ordinary temperature when water solutions are brought into contact with rock-forming minerals have been investigated. The result has been to make it apparent that chemical reaction between natural silicates and salt solutions is a very general phenomenon, taking place to a decided extent immediately upon contact, and that the outcome is mainly an exchange of bases in chemically equivalent quantities between solid and solution. The metal of the dissolved salt is precipitated, and an equivalent quantity of silicate is decomposed, and its bases enter the solution. Salt solutions as decomposing agents are much more active than pure water, and are comparable with acids in this respect.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

TWO courses, open free to teachers in London schools, have been arranged at Bedford College for Women (University of London) for the Michaelmas term; they are:—(1) "The Organisation of Nature-study Courses in London Schools," lecturer, Miss M. R. N. Holmer, Saturdays, 10.30, beginning October 5; (2) "Geology for Teachers of Physical Geography," lecturer, Dr. C. A. Raisin, Wednesdays, 6 p.m., beginning October 9.

IN connection with the garden produce, poultry, and honey competitions of the Kent County Council and of the National Potato Society at the South-Eastern Agricultural College, Wye, Kent, on Wednesday, October 2, a conference will be held, when an address will be given by the principal, Mr. M. J. R. Dunstan, to be followed by discussion.

SIX lectures, open to the public without payment or ticket, on the "History of Statistics and the Nature and Aims of Modern Statistical Methods," will be given at